Climate Change Summary, Whitman Mission National Historic Site, Washington

Patrick Gonzalez

Natural Resource Stewardship and Science, U.S. National Park Service, Washington, DC

March 12, 2014

Climate Trends for the Area within Park Boundaries

- While temperatures have warmed globally, the area of the park is unusual because average temperature has not increased since 1950 (Figure 1).
- Since 1950, precipitation has increased, but the trend is not statistically significant (Figure 2).
- Models project future warming and increases in precipitation (Figures 1-2).

Changes per century (data Daly et al. 2008, IPCC 2013; analysis Wang et al. in preparation). The table only gives central values. Figures 1 to 3 show the uncertainties around these values.

	1950-2010	2000-2050	2000-2100
Historical			
temperature	~0		
precipitation	+21%		
Projected (compared to 1971-2000)			
Low emissions (IPCC RCP 4.5)			
temperature		+2.1ºC (3.8ºF.)	+2.8ºC (5.0ºF.)
precipitation		+5%	+6%
High emissions (IPCC RCP 6.0)			
temperature		+1.8ºC (3.2ºF.)	+3.2ºC (5.8ºF.)
precipitation		+5%	+10%
Highest emissions (IPCC RCP 8.5)			
temperature		+2.7ºC (4.9ºF.)	+4.8ºC (8.6ºF.)
precipitation		+7%	+10%

Potential Future Vulnerabilities for the Northwestern U.S.

- Under high emissions, the number of days with a maximum temperature >35ºC (95º) in the area of the park may increase 3 to 6 days per year by 2100 (Dalton et al. 2013).
- Summer water deficits may increase in southeast Washington watersheds (Dalton et al. 2013).
- Wildfire and mountain pine beetle outbreaks may continue and increase (Dalton et al. 2013).
- Winter ranges of numerous bird species have shifted northward 0.5 ± 2.4 km (0.3 ± 1.5 mi.) per year (1975-2004) across the U.S. and shifts may continue (La Sorte and Thompson 2007).

Figure 1. Temperature.
Historical and projected average annual average temperature for the area within park boundaries. For projections, each bar shows one standard deviation above and below the average of up to 33 climate models. (Data: Daly et al. 2008, IPCC 2013. Analysis: Wang et al. in preparation, University of Wisconsin and U.S. National Park Service).

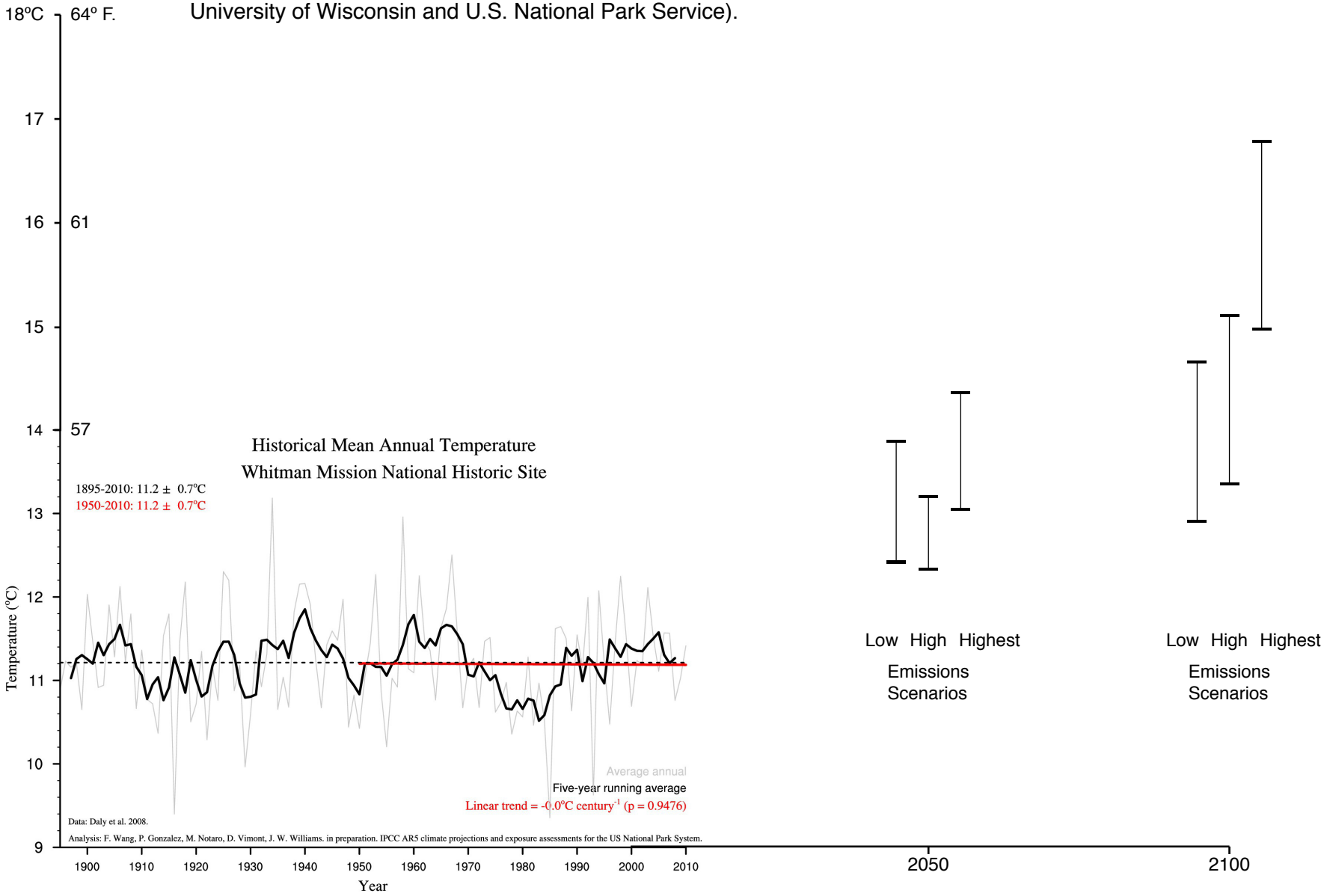
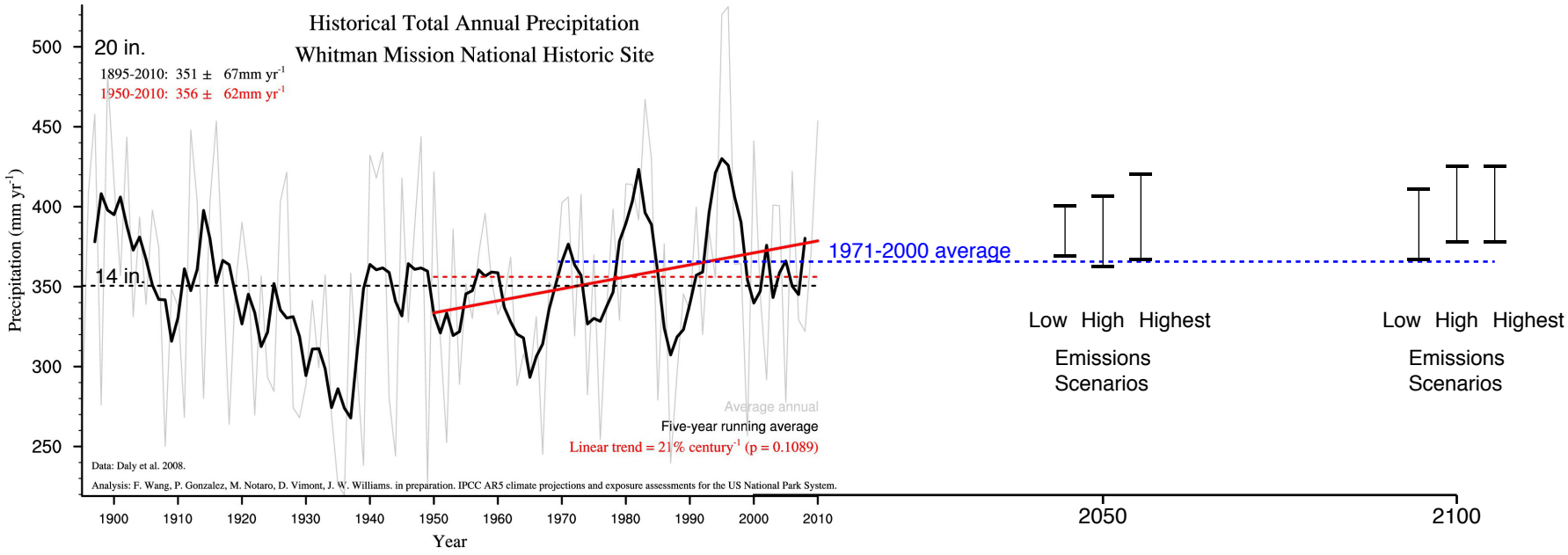


Figure 2. Precipitation.
Historical and projected annual total precipitation for the area within park boundaries.
For projections, each bar shows one standard deviation above and below the average of up to 33 climate models. (Data: Daly et al. 2008, IPCC 2013. Analysis: Wang et al. in preparation, University of Wisconsin and U.S. National Park Service).



References

Dalton, M.M., P.W. Mote, and A.K. Snover (eds.) 2013. Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities. Island Press, Washington, DC.

Daly, C., M. Halbleib, J.I. Smith, W.P. Gibson, M.K. Doggett, G.H. Taylor, J. Curtis, and P.P. Pasteris. 2008. Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. International Journal of Climatology 28: 2031–2064.

Intergovernmental Panel on Climate Change (IPCC). 2013. Climate Change 2013: The Physical Science Basis. Cambridge University Press, Cambridge, UK.

Kunkel, K.E, L.E. Stevens, S.E. Stevens, L. Sun, E. Janssen, D. Wuebbles, K.T. Redmond, and J.G. Dobson. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. Part 6. Climate of the Northwest U.S. National Oceanic and Atmospheric Administration, Technical Report NESDIS 142-6, Washington, DC.

La Sorte, F.A. and F.R. Thompson. 2007. Poleward shifts in winter ranges of North American birds. Ecology 88: 1803-1812.

Wang, F., P. Gonzalez, M. Notaro, D. Vimont, and J.W. Williams. in preparation. IPCC AR5 climate projections and exposure assessments for the US National Park System.